COMPRESSION STRUT

BACKGROUND OF THE INVENTION

Field of the Invention

The invention relates to a compression strut, comprising a pre-loaded extension spring and an integrated damper as employed for example as lifting aids in trunk lids or engine hoods of passenger cars.

Background Art

In compression struts of the generic type, the damper simultaneously serves as a guiding and damping unit. The damper in the form of a piston-cylinder unit absorbs the motion of the extension spring over the entire stroke thereof. This may entail drawbacks, in particular when the kinematics of the lid opening and closing motion are such that, when the lid is stopped in an intermediate position, the power of the spring will no longer be sufficient for lifting the lid, the damping effect being too strong.

SUMMARY OF THE INVENTION

It is an object of the invention to embody a compression strut of the type mentioned at the outset such that the motion of displacement is damped only in a final stage.

According to the invention, this object is attained by the features of claim 1. The gist of the invention resides in that frictional conditions within the compression strut have been modified as against familiar spring struts, damping taking place only in a final range of stroke of the spring. The re-

maining range is characterized by nearly frictionless motion of solely the actuating tappet which is then disengaged from the piston rod of the damper.

Further features, advantages and details of the invention will become apparent from the ensuing description of an exemplary embodiment, taken in conjunction with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a longitudinal sectional view of a compression strut according to the invention when contracted;

Fig. 2 is an illustration of part of the compression strut on an enlarged scale as compared to Fig. 1;

Fig. 3 is a view of the compression strut when extended;

Fig. 4 is an illustration of the compression strut employed as a lifting aid for a trunk lid which is illustrated when opened; and

Fig. 5 is a view of the compression strut with the trunk lid closed.

DESCRIPTION OF A PREFERRED EMBODIMENT

The compression strut seen in the drawing comprises a helical extension spring 1 which inside includes a guiding and damping unit 3 coaxially of its central longitudinal axis 2. This unit 3 comprises a – related to the entire length of the unit 3 – short hydraulic damper 4 and an operating element 5.

The damper 4 has a substantially tubular housing 6 with a damping piston 7 disposed and guided therein, a piston rod 8 being mounted on the damping piston 7 and sealingly extended out of the housing 6. The interior space of the housing 6 is filled with a damping fluid. On the side turned away from the piston rod 8, the piston 7 is loaded by a pre-stressed extension spring 9 which loads the piston rod 8 in the direction of extension.

The operating element 5 comprises a guide tube 10, with an actuating tappet 11 being arranged therein coaxially of the axis 2 for axial displacement and guided twice radially of the axis 2. The guide tube 10 is joined to the housing 6 of the damper 4 by means of a threaded joint 12 so that the housing 6 and the guide tube 10, and the tube 10 together with the actuating tappet 11, constitute a deflection-resistant unit.

Threaded bushes are tightly mounted on both ends of the extension spring 1, serving as abutments 13, 14. Holding bushes 15, 16 are screwed into these abutments 13, 14, the threads 17, 18 thereof working in opposite directions i.e., a thread 17 is right-handed while the other thread 18 is left-handed. The free end of the housing 6 supports itself in the holding bush 15. The end of the tappet 11 that projects from the guide tube 10 is fixed in the holding bush 16. Both holding bushes 15, 16 are provided with fastening elements 19, 20 in the form of so-called ball cups. As a result of the design of the abutments, the basic length of travel of the spring system can be set, and thus the pre-load thereof.

A comparison of Figs. 1 and 2 on the one hand and 3 on the other shows that elongation of the compression strut takes place by opposite tensile forces being applied to the fastening elements 19, 20. The actuating tappet

11 is lifted off the piston rod 8 which is pushed by the extension spring 9 as far as possible out of the housing 6. The actuating tappet 11 is almost frictionlessly extended from the guide tube 10.

When the extension spring 1 is released and contracts, the actuating tappet 11 is pushed into the guide tube 10 nearly free from friction and thus non damped. It will bear against the free end of the piston rod 8 right before termination of linear contraction of the compression strut, pushing the piston rod 8 into the housing 6 by corresponding hydraulic damping. This means that only the maximal length of displacement of the piston rod 8 is damped, constituting a damping range a. As opposed to this, the no-load range b given by the distance of the extended piston rod 8 from the extended actuating tappet 11 as seen in Fig. 3 is non damped. As seen in the drawing, $b > a$ applies. Consequently, only a short range is damped of the total range $c = a + b$.

Figs. 4 and 5 diagrammatically illustrate the use of a compression strut according to the invention in a vehicle, only the rear portion of which is illustrated. It includes part of the body 21, the rear wheels 22 and a trunk 23 which is closable by a trunk lid 24. The trunk lid 24 is pivotable about a pivot 25 into an opened position (Fig. 4) and a closed position (Fig. 5).

The compression strut is articulated by its fastening element 19 to an articulation point 26 on the body 21 in the vicinity of the trunk 23, and by its fastening element 20 to an articulation point 27 on the lid 24. The connection is such that the compression strut is being elongated upon closing of the trunk i.e., the extension spring 1 continues to be pre-loaded, whereas opening the lid 24 will lead to linear contraction i.e., release of the extension spring 1, with the compression strut shortening. The distance of the

point 27 where the compression strut is articulated to the lid 24, from the point 26 of articulation to the body 21 is reduced upon opening of the lid 24. Lifting the trunk lid 24 is thus supported by the compression strut. As seen from the above description of the compression strut, the actuating tappet 11 will bear against the piston rod 8 of the damper 4 only at the end of the motion of opening the trunk lid 24 so that the motion of opening the lid 24 from the closed position (Fig. 5) is substantially non damped, damping taking place only shortly before the entirely opened position (Fig. 4) is reached.